

REMARKS

I. Introduction

By the present Amendment, claims 1 and 26 have been amended. No claims have been added or cancelled. Accordingly, claims 1-6 and 26-29 remain pending in the application. Claims 1 and 26 are independent.

II. Office Action Summary

In the Office Action of January 14, 2009, claims 1, 4, 5, 26, and 27 were rejected under 35 USC §102(b) as being anticipated over Ko et al. ("Ko"). Claim 2 was rejected under 35 USC §103(a) as being unpatentable over Ko in view of Henry et al. ("Henry"). Claim 3 was rejected under 35 USC §103(a) as being unpatentable over Ko in view of U.S. Patent No. 6,801,650 issued to Kikuchi et al. ("Kikuchi"). Claims 6, 28, and 29 were rejected under 35 USC §103(a) as being unpatentable over Ko in view of Xu et al. ("Xu"). These rejections are respectfully traversed.

III. Rejections under 35 USC §102

Claims 1, 4, 5, 26, and 27 were rejected under 35 USC §102(b) as being anticipated over Ko. Regarding this rejection, the Office Action alleges that Ko discloses a method for classifying defects that includes obtaining an image of a defect on a sample, extracting a characteristic of the defect from the image, and classifying the defect in accordance with the extracted characteristic and based on a rule-based classification and a learning type classification. The Office Action further alleges that Ko's classifying step includes calculating a set of first likelihoods of the defect belonging to each of a plurality of defect classes of the rule-based classification, calculating a set of second likelihoods of the defect belonging to each

of a plurality of defect classes of the learning type classification, and calculating a third set of likelihoods of the defect belonging to each of the defect classes of the learning type classification by the first and second likelihoods. Furthermore, the Office Action indicates that Ko discloses classifying the defects by using the third likelihoods.

As amended, independent claim 1 defines a method of classifying defects that comprises:

- obtaining an image of a defect on a sample;
- extracting a characteristic of the defect from the image; and
- classifying the defect in accordance with the extracted characteristic, and based on a rule-based classification and a learning type classification,

wherein the step of classifying further comprises:

- calculating a set of first likelihoods of the defect belonging to each of a plurality of defect classes of the rule-based classification, by use of the extracted characteristic;
- calculating a set of second likelihoods of the defect belonging to each of a plurality of defect classes of the learning type classification, by use of the extracted characteristic;
- calculating a third set of likelihoods of the defect belonging to each of the defect classes of the learning type classification and/or the defect classes of the rule-based classification, by use of the first and second likelihoods; and
- classifying the defect by use of the third likelihoods; and

wherein the rule-based classification and learning type classification are present in a parallel relationship with each other and independent of each other.

According to the method of independent claim 1, an image of a defect on a sample is first obtained, and a characteristic of the defect is extracted from the image. Next, the defect is classified in accordance with the extracted characteristic, and based on a rule-based classification and a learning type classification. The classification step also includes several substeps. Specifically, a set of first

likelihoods that the defect belongs to each of the plurality of defect classes of the rule-based classification is calculated using the extracted characteristic. Next, a set of second likelihoods is calculated that the defect belongs to each of a plurality of defect classes of the learning type classification using the extracted values. A set of third likelihoods of the defect belonging to each of the defect classes of the learning type classification and/or the defect classes of the rule-based classification is calculated using the first and second likelihoods. The defect is then classified using the third likelihoods. Furthermore, according to independent claim 1, the rule-based classification and learning type classification are present in a parallel relationship and are also independent of each other. According to such a method, it is possible to resolve instabilities in performance of the learning type classification when only a small amount of data is present. See paragraphs [0115] and [0116] of the published application, and Fig. 11.

The Office Action alleges that Ko discloses all the features recited in independent claim 1. Applicants' review of Ko, however, has failed to reveal any disclosure or suggestion for a rule-based classification and learning type classification that are in a parallel relationship with each other. Rather, Ko appears to disclose a rule-based classification and learning classification that are handled in a hierarchical manner. More particularly, there is no disclosure for features now recited in independent claim 1, such as:

wherein the rule-based classification and learning type classification are present in a parallel relationship with each other and independent of each other.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2-6 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

As amended, independent claim 26 defines an apparatus for classifying defects that comprises:

- an imager which obtains an image of a defect on a sample;
 - a characteristic extractor which extracts a characteristic of the defect from the image;
 - a classifier which classifies the defect in accordance with the extracted characteristic, and based on a rule-based classification and a learning type classification, and
 - a display for displaying the image of the defect and the classification result on a screen;
- wherein said classifying means comprises:
- a rule-based classifier which calculates a set of first likelihoods of the defect belonging to each of plurality of rule classes by use of the characteristics of the defect,
 - a learning type classifier which calculates a set of second likelihoods of the defect belonging to each of a plurality of defect classes by use of the characteristic of the defect; and
 - a calculator which calculates a set of third likelihoods of the defect belonging to each of said defect classes and/or rule classes, by use of the first and second likelihoods, and
 - a classifier which classifies the defects by use of the calculated third likelihoods; and
- wherein the rule-based classification and learning type classification are present in a parallel relationship with each other and independent of each other.

Independent claim 26 has been amended in a manner that is somewhat similar to independent claim 1. In particular, this claim now recites that the rule-based classification and learning type classification are provided in a parallel relationship. Furthermore, they are independent of each other. As previously

discussed with respect to independent claim 1, Ko does not appear to provide any disclosure or suggestion for such features.

It is therefore respectfully submitted that independent claim 26 is allowable over the art of record.

Claims 27-29 depend from independent claim 26, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 26. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

IV. Rejections under 35 USC §103

Claims 2, 3, 6, 28, and 29 were rejected under 35 USC §103(a) as being unpatentable over Ko in view of various secondary references. As previously indicated, however, Ko fails to disclose or suggest various features that are now recited in independent claims 1 and 26, from which these claims began. Applicants' review of these secondary references has also failed to reveal any disclosure or suggestion for the same features. Accordingly, these combinations of references still fail to render the claimed invention obvious.

It is therefore respectfully submitted that these references are further allowable over the art of record.

V. Conclusion


For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 500.43701X00).

Respectfully submitted,
ANTONELLI, TERRY, STOUT & KRAUS, LLP.

/Leonid D. Thenor/ 
Leonid D. Thenor
Registration No. 39,397

LDT/vvr
1300 N. Seventeenth Street
Suite 1800
Arlington, Virginia 22209
Tel: 703-312-6600
Fax: 703-312-6666

Dated: May 14, 2009